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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Bacos, Marie-Pierre Confirmation No. 3474  
Application No. : 10/815,526  
Filed : March 31, 2004  
Title : PROCESS FOR FORMING A PROTECTIVE COATING CONTAINING  
ALUMINIUM AND ZIRCONIUM ON A METAL  
  
Grp./Div. : 1792  
Examiner : Michael G. Miller  
  
Docket No. : 52186/N75

DECLARATION UNDER 37 CFR § 1.132

Commissioner for Patents  
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Pasadena, CA 91109-7068

Commissioner:

1. I, Marie-Pierre BACOS, reside at 19 bis rue Pasteur 92160 ANTONY FRANCE, do declare as follows:

2. I have a PhD degree in **Applied Chemistry** from Paris-6 University. I have been employed by ONERA since 1983. My responsibilities involve research in the area of materials, and I consider myself an expert on protective coatings issues.

3. I have prepared the enclosed Diagram, entitled "Zirconium oxychloride decomposition without oxygen".

4. This Diagram has been prepared by me to show the thermo dynamical calculation of zirconium oxychloride decomposition under an atmosphere of pure argon, thus in the absence of oxygen.

5. This Diagram was obtained by heating one kilomole of zirconium oxychloride (178kg) between 25 and 1500°C under an atmosphere of pure argon.

6. The software, HSC Chemistry 6.0 ; OUT0 KUMPU technology, was utilized, to allow for the calculation of the Diagram, at each temperature stage, the concentration of the

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different products coming from the decomposition. For calculation purpose, no value is equal to 0 (log 0 is not easy to handle).

7. In the Diagram, the Avogadro limit appears as a gray zone. The various concentrations are expressed in moles (one mole =  $6.022 \cdot 10^{23}$  molecules).

8. The Diagram clearly shows that, under the influence of temperature, zirconium oxychloride is converted into a vapor and is decomposed. The decomposition products are  $ZrO_2$ ,  $ZrCl_4$ ,  $ZrCl_3$  and  $ZrCl_2$  both in a solid state (continuous lines) and in a gaseous state (dotted lines). But no Zr metal is obtained. This is impossible, the calculated concentration for Zr being lower than the Avogadro limit.

9. I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under § 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Date: 02. 26. 2009

By: Pierre-Pierre BACOS  
[name]

626/795-9900

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Decomposition without oxygen of the zirconyl chloride (zirconium oxychloride,  $\text{ZrOCl}_2$ , CAS 7699-43-6)

